

2H 2019 LCOE Update

Solar, wind and power prices at the crossroads

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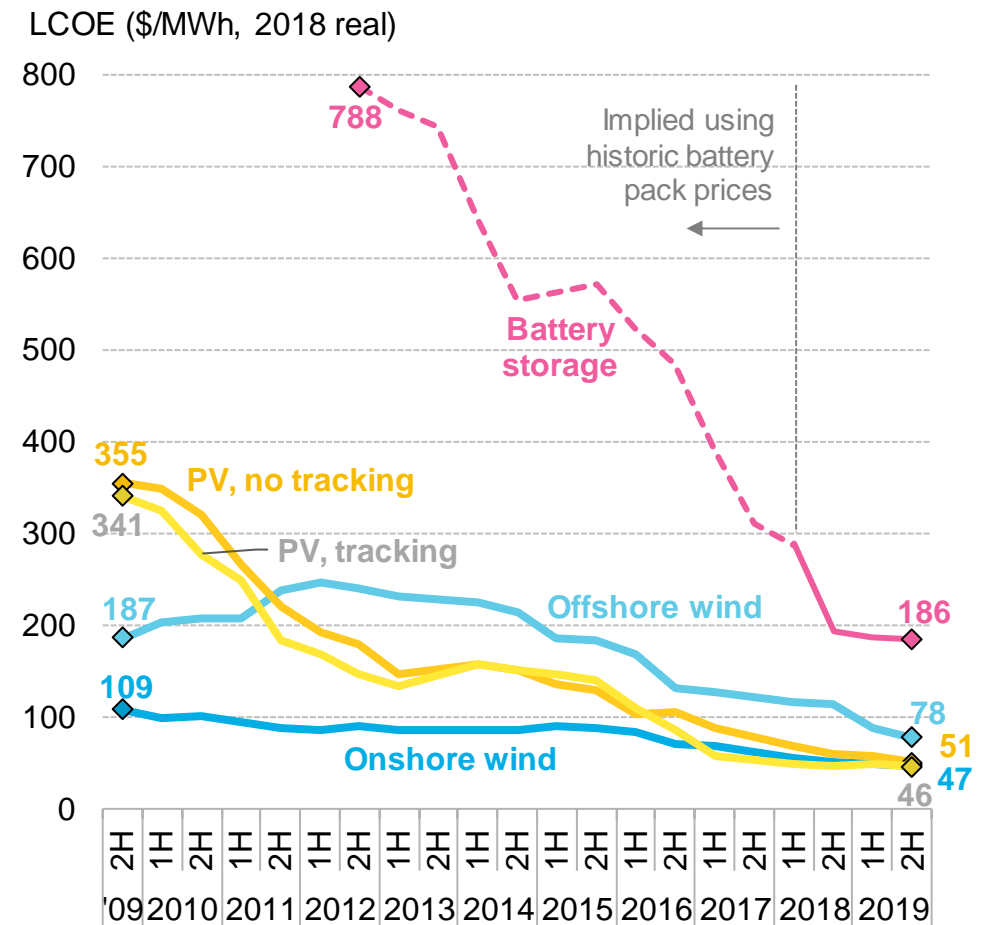
Executive Summary (1/2)

1. Our global benchmark LCOE for new-build onshore wind and PV projects are at \$47 and \$51/MWh today, down 6% and 11% respectively from 1H 2019. This is mainly due to cheaper equipment. The price of wind turbines is down 7% on average globally since 2H 2018. And the capex for PV in China, the world's largest solar market, has fallen 11% in the last six months. Weak demand for new plants in China left developers and engineering, procurement and construction (EPC) firms eager for business, and this put pressure on capex.
2. Offshore wind has seen the fastest cost declines, down 32% from 2H 2018 and 12% from our 1H 2019 publication. Our current global benchmark estimate is \$78/MWh. New offshore wind projects throughout Europe now deploy turbines up to 10MW, unlocking capex and opex savings.
3. Our global LCOE benchmark for battery storage with four-hour duration sits today at \$186/MWh. This is down 35% since the beginning of 2018, and 76% from 2012, implied by our historical battery pack prices. The United States has the lowest levelized cost of new battery storage, at \$171/MWh, mainly owing to more favourable financing terms as the U.S. utility-scale storage market is more mature than in other regions.
4. We estimate that some of the cheapest PV projects financed in the last six months will be able to achieve an LCOE of \$27-36/MWh, assuming competitive returns to their equity investors. Those can be found in India, Chile and Australia. Best-in-class onshore wind projects in Brazil, India, Mexico and Texas can reach \$26-31/MWh.
5. PV and onshore wind is winning the race as the cheapest sources of new bulk generation with two-thirds of the global population living in countries where PV or wind is the cheapest new electricity generation. Stubborn exceptions to this rule – namely Japan and countries in Southeast Asia – are now starting to see renewables challenge the least competitive coal and combined-cycle gas turbine projects on a new-build basis.
6. Ongoing cost declines mean that benchmark PV and wind plants are just 4-5 years away from starting to challenge existing coal and gas plants on a cost-of-energy basis. Our analysis suggests that best-in-class new PV plant in China can now compete with the least efficient existing coal plants on an annualized dollar per MWh basis. Similarly in the U.S., recently financed wind farms in the most windy states are at cost parity with the least efficient operating gas plants, even without the production tax credit. And finally in India, new PV can be cheaper than running existing coal-fired power plants that source fuel from the seaborne market, however power plants running on cheap domestic pithead coal remain more competitive.
7. New PV and onshore wind power plants have now reached parity with average wholesale prices in California, China and parts of Europe. However, comparing LCOEs, which are calculated over the lifetime of the asset, to wholesale prices that are derived from the past year is not an indication of the viability of projects. Future realised power prices will determine whether merchant renewables projects can provide an adequate return to investors.

Executive Summary (2/2)

8. Our global levelized cost of capacity benchmark for short-duration battery sits at \$112/kW/yr, down 4% from 1H 2019 as capex pricing across countries consolidates. Today, up to one-hour storage duration, batteries are already cheaper than new-build gas plants for meeting narrow peaks everywhere but the U.S., where cheap gas gives open-cycle gas turbines (OCGT) an edge. However, we expect battery storage capex to halve by 2030, making energy storage plants with storage duration up to four hours competitive with other technologies that meet longer peaks in demand, such as gas reciprocating engines (GRE) and pumped-hydro plants.
9. Coal has so far dominated electricity in Asia, but recent pro-gas policies in China and the expansion of the LNG market suggest a brighter future for gas in the region. In China and India, we don't expect that new build combined-cycle gas turbine plants will be able to challenge new coal power plants on a cost-of-energy basis, unless the gas price falls below \$3/MMBtu, far away from the current regulated prices at \$5-9/MMBtu, let alone LNG prices at \$9-12/MMBtu.
10. This analysis covers nearly 7,000 projects across 20 technologies and 46 countries around the world. All updated technology costs and performance inputs are available both in BloombergNEF's proprietary project finance model: *Energy Project Asset Valuation Model* ([web](#) | [terminal](#)) or in the *2H 2019 LCOE Data Viewer* ([web](#) | [terminal](#)).

Global benchmarks – PV, wind and batteries



Source: BloombergNEF Note: The global benchmark is a country weighted-average using the latest annual capacity additions. The storage LCOE is reflective of a utility-scale Li-ion battery storage system with four-hour duration running at a daily cycle and includes charging costs assumed to be 60% of wholesale average power price.

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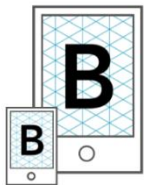
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